MCF 3M EXAM REVIEW – Quadratic Relations

Questions 1 to 5 refer to the example below

Kyle has loved model trains ever since he was a young boy playing with his grandfather’s toy trains. He has decided that he can make a small business out of buying old trains from yard sales, refinishing them and reselling them on the internet. He has done a study to see what his profit margins are like. Here is the analysis he has completed.



1. What is the maximum profit possible?
2. How many trains need to be sold in order to make this profit?
3. If Kyle sells 50 trains, what will his profit be?
4. A company is said to “break even” when revenue equals expenses, or when profit equals zero. How many trains are needed for Kyle to break even?
5. What is the equation for the graph above?
6. Expand a) y = 3(x – 2)(x + 3) b) y = -2 (x – 4)2 + 3
7. Complete the square for the following quadratic function to find the vertex

y = -5x2 – 20x – 23

1. Find the factored form to find the zeroes of the quadratic function

y = 18x2 – 9x – 35

1. Let a parabola be defined by the equation y = -3(x – 1)2 + 3
   1. graph the parabola on the grid provided



From the graph, identify the

Zeroes

Axis of symmetry

Optimal value

* 1. write the equation in factored form

8. A cannonball is shot from a building top to the field below. The equation for the height of the cannonball above the ground is given by

h = - 4.9 t2 + 19.6 t + 58.8 where h is the height above the ground, in m

and t is the time in seconds

Find how high above the ground the cannonball starts from, and the maximum height the ball flies

Remember to use proper mathematical form:

state the equation, identify what values of time you are substituting,

provide a clear solution using good mathematical form that is easy to follow, and provide concluding sentences

Mathematical Models – Exponential Relations

1. The equation which represents an exponential relationship is

|  |  |  |  |
| --- | --- | --- | --- |
| (a) y = 3x | (b) y = 4x2 | (c) y = 2x+3 | (d) y = x |

1. Evaluate the following:

|  |  |  |
| --- | --- | --- |
| (a) 3–2 | (b) 2.035/3 | (c) 7050 |

1. Simplify the following. Write each answer as an expression with a single positive exponent.

|  |  |  |
| --- | --- | --- |
| (a) 23 × 25  d) (165)1/2 | (b) (42)7  e) 642/3 x 163 | (c) |

1. Using the grid below, graph the equation y = 4x



1. The graph below shows the projected value of a car over the next 10 years.



* 1. Does this graph show traits of a linear relationship, quadratic relationship, or exponential relationship? Explain your reasoning.
  2. Using the graph, estimate the car’s value.
  3. originally \_\_\_\_\_\_\_\_\_ b. after 2 years \_\_\_\_\_\_\_\_\_\_

c. after 7 years \_\_\_\_\_\_\_\_\_\_ d. after 10 years \_\_\_\_\_\_\_\_\_\_

* 1. Based on the graph, what percent of its value does the car lose each year?

d) Write the equation for the depreciation of the vehicle.

7. A scientist is working with a bacteria culture. If the population of bacteria began at 35, and doubles in 4 days,

a) find the equation for the bacteria count at any day, n

b) How many bacteria do you expect to have in 8 days?

c) in 75 days?

Mathematical Models – Sinusoidal Relations

1 For each equation, describe the transformation then state the amplitude, period , phase shift and vertical translation for the graph of the function. Sketch each graph below

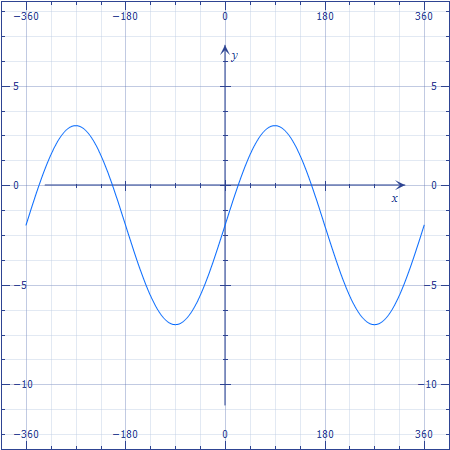
a. 

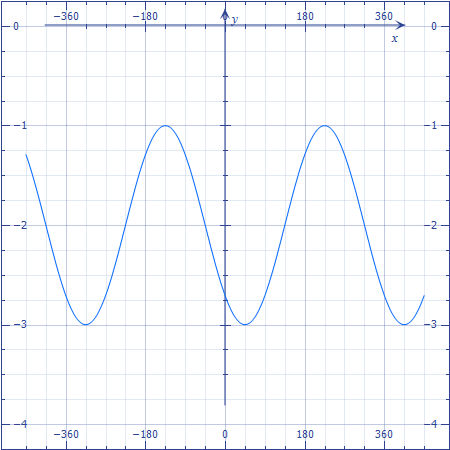
b. 

c. 



2. Identify the equation for each graph





3. A ferris wheel is 50 feet in diameter, with the center 60 feet above the ground. You enter from a platform at the 3 o'clock position. It takes 80 seconds for the ferris wheel to make one revolution.

a) Find the equation that gives your height above the ground at time t (t=0 when you entered).

b) At what height would you be at 50 s?

Personal Finance

Questions 1 to 5 refer to the example below

An RRSP is an investment offered by many financial institutions. In a particular RRSP, which is compounded monthly, the amount in dollars (A) in the RRSP after n months is given by the equation



1. What is the principal of the investment?
2. What is the amount in the RRSP after 3 years?
3. What is the amount in the RRSP after 5.5 years?
4. How much **interest** will the RRSP have earned in one year?
5. What is the annual interest rate (compounded monthly) of this RRSP?
6. How much money is needed in a bank account (which pays 6.3% compounded quarterly) in order to have $6000 after 4 years? (Use the equation A = P( 1 + i )n )
7. You are trying to explain the power of compound interest with the following example: You will deposit $1000 into each of two bank accounts which pay 7.5% interest per year, but Account A pays simple interest and Account B pays the interest compounded quarterly.

Use the table below to demonstrate the difference between simple and compound interest.

* 1. Use the formulas for simple interest (**A = P + Prt**), and compound interest (**A = P(1 + i)n**), to calculate the amount in each account after the first year.

Simple Interest Compound interest

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BANK ACCOUNT A | |  | BANK ACCOUNT B | |
| Year | Amount in Account |  | Year | Amount in Account |
| 0 | $1000 |  | 0 | $1000 |
| 1 |  |  | 1 |  |
| 2 |  |  | 2 |  |
| 3 |  |  | 3 |  |
| 4 |  |  | 4 |  |
| 5 |  |  | 5 |  |

* 1. How many years will it take to double your investment in each account?

8. Ashley and Brianna have decided to start RRSP’s to save for retirement. Ashley finds a bank that will give 3.25%/a compounded monthly.

a) If Ashley consistently puts $50 per month in her RRSP for the next 40 years, how much will her RRSP be worth in 40 years time?

b) If Brianna places her RRSP in a different bank, they will guarantee an interest rate of 4%/a, but compounded quarterly. How much does Brianna need to deposit every quarter to have as much as Ashley in 40 years?

9. Andrew wants to have $10 000 to put towards a motorcycle in 5 years. If he can put $4000 into an account this year in an investment that pays interest compounded weekly, what interest rate does he need to have to reach his goal?

10. Jane places $20 weekly into an RRSP for 5 years in an investment that pays 6.5 %/a compounded weekly. At the end of 5 years, she needs to remove $1000 to help pay for a financial emergency, and cannot afford to continue payments for 2 years. She leaves the remaining money in the account for this time. How much money is in the account at the end of the 7 years? Draw a timeline!

Geometry & Trigonometry

Questions 1 to 3 refer to the triangle below

R = 90°

20cm

26cm

P

Q

1. The measure of the missing side is
2. The measure of the angle at vertex P is

3. The measure of the angle at vertex Q is

4. Solve for the measure of Q

30°

Q

100°

25cm

5. Amy is trying to find out the height of the tree in her back yard. She stands 15.5 m from the base of the tree, and measures the angle to see the top of the tree as 350. Draw a diagram of the tree and Amy. Calculate the height of the tree based on Amy’s measurements.

6. Three islands- FOGO, Twillingate and Tram Habour form a triangular pattern in the ocean. FOGO and Twillingate are 15 miles apart. The angle between Twillingate and Tram Harbour from FOGO is 450. The angle between Tram Harbour and FOGO from Twillingate is 650.

(Remember to use proper mathematical form! State your given information, draw a diagram and label everything you know, write a solution that is easy to follow, and write a concluding sentence!)

* 1. Draw a diagram
  2. How far is Tram Harbour from the other two islands?

7. Spencer is an engineer. In his last project, he had to determine the length of a tunnel to be built through a mountain. He chooses a place facing the mountain, and measures a distance of 840 m from one end of the tunnel to the point. He measures a distance of 760 m from the other end of the tunnel to the same point. The angle at the point to both ends of the tunnel is 620. How long is the tunnel?

760 m

840 m

620

tunnel